



STATE OF DELAWARE  
**DEPARTMENT OF TRANSPORTATION**  
800 BAY ROAD  
P.O. BOX 778  
DOVER, DELAWARE 19903

JENNIFER COHAN  
SECRETARY

October 5, 2020

Mr. Dev Sitaram  
Karins and Associates, Inc.  
17 Polly Drummond Center  
Suite 201  
Newark, DE 19711

Dear Mr. Sitaram:

The enclosed Traffic Impact Study (TIS) review letter for the **Vista at Red Lion (Sections 1 and 2)** (Protocol Tax Parcel 10-052.00-011) development has been completed under the responsible charge of a registered professional engineer whose firm is authorized to work in the State of Delaware. They have found the TIS to conform to DelDOT's Development Coordination Manual and other accepted practices and procedures for such studies. DelDOT accepts this letter and concurs with the recommendations. If you have any questions concerning this letter or the enclosed review letter, please contact me at (302) 760-2167.

Sincerely,

Troy Brestel  
Project Engineer

TEB:km

Enclosures

cc with enclosures: Ms. Pamela Scott, Saul, Ewing, Arnstein & Lehr, L.L.P.  
Ms. Constance C. Holland, Office of State Planning Coordination  
Mr. George Haggerty, New Castle County Department of Land Use  
Mr. Owen Robotino, New Castle County Department of Land Use  
Mr. Mir Wahed, Johnson, Mirmiran & Thompson, Inc.  
Ms. Joanne Arellano, Johnson, Mirmiran & Thompson, Inc.  
DelDOT Distribution

## DelDOT Distribution

Brad Eaby, Deputy Attorney General

J. Marc Coté, Director, Planning

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Todd Sammons, Assistant Director, Development Coordination

T. William Brockenbrough, Jr., County Coordinator, Development Coordination

Chris Sylvester, Traffic Studies Manager, Traffic, DOTS

Kevin Canning, Canal District Engineer, Canal District

Matthew Vincent, Canal District Public Works Engineer, Canal District

Jared Kaufmann, Service Development Planner, Delaware Transit Corporation

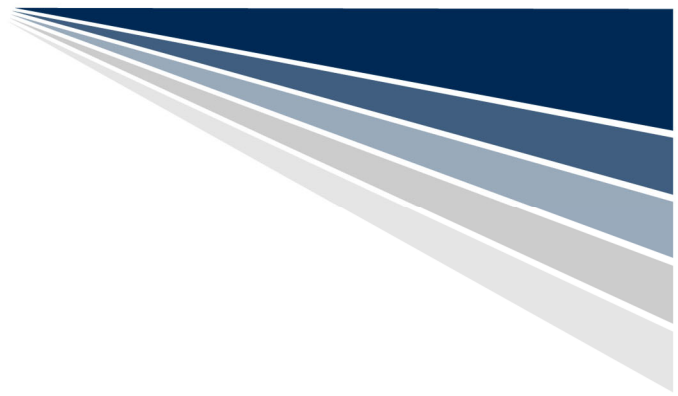
Sireen Muhtaseb, New Castle Review Coordinator, Development Coordination

Anthony Aglio, Planning Supervisor, Statewide & Regional Planning

Pao Lin, Subdivision Manager, Development Coordination

Mark Galipo, Traffic Engineer, Traffic, DOTS

Claudy Joinville, Project Engineer, Development Coordination



October 1, 2020

Mr. Troy Brestel  
Project Engineer  
Development Coordination  
DelDOT Division of Planning  
P O Box 778  
Dover, DE 19903

RE: Agreement No. 1774  
Project Number T201769002  
Traffic Impact Study Services  
**Task 28A-Vista at Red Lion Section 1 and 2**

Dear Mr. Brestel:

Johnson, Mirmiran and Thompson (JMT) has completed the review of the Traffic Impact Study (TIS) for Vista at Red Lion Section 1 and 2 prepared by Karins and Associates dated December 2018. This task was assigned Task Number 28A. Karins and Associates prepared the report in a manner generally consistent with DelDOT's *Development Coordination Manual*.

The TIS evaluates the impacts of the proposed development located along Old Porter Road between the Porter Road and Delaware Route 71 intersections. The proposed development would be comprised of 240 townhouses and 282 age-restricted detached houses; for the purposes of the TIS, 244 townhouses and 283 age-restricted detached houses were considered. The townhouses would be located on the north side of Old Porter Road and the age-restricted detached houses would be located on the south side of Old Porter Road. Based on the May 30, 2017, Concept Plan prepared by Karins and Associates, two full access points are proposed on each side of Old Porter Road creating two new four-way intersections. The subject property is on an approximately 203.37-acre assemblage of parcels that are zoned as ST (Suburban Transition), and no rezoning is proposed. Construction is expected to be complete in 2024.

DelDOT completed an improvement project within the study area: the *HSIP NCC SR 71, Old Porter Road to SR 7* (Contract #T201000701) project. The project was designed to improve safety and operations at the Delaware Route 71 intersections with Old Porter Road, Church Road, and Delaware Route 7.

As part of the DelDOT *HSIP NCC SR 71, Old Porter Road to SR 7* project, a traffic signal was installed at the Delaware Route 71 and Old Porter Road intersection. The northbound Delaware Route 71 approach to Old Porter Road was modified to provide one left turn lane and one through lane, the southbound Delaware Route 71 approach to Old Porter Road was modified to provide one through lane and one right turn lane, and the eastbound Old Porter Road approach was modified to provide one left turn lane and one channelized right turn lane. At the Delaware Route 71 intersection with Church Road, the northbound Delaware Route 71 approach was modified to provide one left turn lane, one through lane, and one right turn lane and the eastbound Church



Road approach was modified to provide one shared left turn/through lane and one right turn lane. Access from northbound Delaware Route 7 to Church Road has been restricted. At the Delaware Route 7 and Delaware Route 71 intersection, each approach was modified to provide one left turn lane, one through lane, and one right turn lane, with the exception of the northbound Delaware Route 71 approach which was modified to provide one left turn lane and one through lane. With the provision of separate left turn lanes along Delaware Route 7, the signal was modified to operate with protected and permissive left turn phasing along Delaware Route 7.

Based on our review of the traffic impact study, we have the following comments and recommendations:

The New Castle County Level of Service (LOS) Standards as stated in Section 40.11.210 of the Unified Development Code (UDC) apply to all signalized, all-way-stop, and roundabout intersections. Based on an evaluation of the signalized intersections, one signalized intersection will require the implementation of physical roadway and/or traffic control improvements:

<b><i>Intersection</i></b>	<b><i>Situations for which LOS deficiencies occur</i></b>
Delaware Route 7/Delaware Route 71	2018 AM and PM Existing (Case 1) 2024 AM and PM without Development (Case 2) 2024 AM and PM with Development (Case 3)

The Delaware Route 7 signalized intersection with Delaware Route 71 exhibits LOS deficiencies during the existing and future conditions with or without the proposed development. However, with signal timing optimizations, the intersections would improve to operate at LOS D during each peak period under Cases 2 and 3. Therefore, it is not recommended that any improvements be implemented by the developer at the Delaware Route 7 intersection with Delaware Route 71.

Additionally, separate from the UDC but based on the LOS evaluation criteria as stated in DelDOT’s *Development Coordination Manual*, movements at the following stop-controlled intersections exhibit LOS deficiencies without the implementation of physical roadway and/or traffic control improvements:

<b><i>Intersection</i></b>	<b><i>Situations for which LOS deficiencies occur</i></b>
Porter Road (New Castle Road 48)/Old Porter Road (New Castle Road 383)	2018 PM Existing (Case 1) 2024 AM and PM without Development (Case 2) 2024 AM and PM with Development (Case 3)
Delaware Route 71/Church Road (New Castle Road 382)	2024 AM and PM without Development (Case 2) 2024 AM and PM with Development (Case 3)

The Porter Road and Old Porter Road intersection exhibits LOS deficiencies under existing and future peak periods with or without the proposed development. To mitigate the unacceptable levels of service, two options were considered, a roundabout design and a traffic signal. Both options, either a roundabout or a traffic signal, would provide acceptable levels of service at this intersection. However, due to the additional right-of-way needed, the relocation of utility poles,



and the adjacent railway that is approximately 50 feet east of the intersection, it is recommended that a signal be installed at this intersection. JMT performed a Signal Justification Study in February 2019 for the Porter Road and Old Porter Road intersection and determined that the eight-hour, four-hour, and peak hour DE MUTCD signal warrants (Warrants 1, 2, and 3) are met during Cases 1, 2, and 3 conditions. Therefore, it is recommended that the developer enter into a signal agreement with DelDOT for the signal installation.

The Delaware Route 71 and Church Road intersection exhibits LOS deficiencies during the future peak periods with or without the proposed development. The capacity constraints are expected along the eastbound Church Road approach. The installation of a traffic signal would mitigate the capacity constraints and improve the intersection to operate at LOS B. However, the installation of a traffic signal is not recommended as this intersection is located within 500 feet of two other signalized intersections, the Delaware Route 71 intersections with Old Porter Road and Delaware Route 7.

In addition, a supplemental Synchro/SimTraffic analysis was performed to analyze the Delaware Route 71 intersection with Church Road considering the signalized intersections of Delaware Route 71 with Old Porter Road and Delaware Route 7. The results of the Synchro/SimTraffic analysis depict the Delaware Route 71 intersection with Church Road to operate with capacity constraints during the future peak periods with or without the proposed developments. However, the calculated 95<sup>th</sup> percentile queue length along the eastbound Church Road approach would be approximately 75 feet which could be accommodated along Church Road without obstructing any adjacent intersections. As such, it is not recommended that any improvements be implemented by the developer at the Delaware Route 71 intersection with Church Road.

Although the proposed site access points along Old Porter Road would operate at acceptable levels of service, an additional evaluation considering the access points configured as one-lane roundabouts was performed to address the December 21, 2018, correspondence from DelDOT Traffic section. Based on the results, the entrances configured as roundabouts would operate at LOS A under Case 3 conditions. Speed information collected from the 7-day ATR data from the TIS reported an 85<sup>th</sup> percentile speed limit of 53 miles per hour along both directions of Old Porter Road and the posted speed limit is 40 miles per hour. As capacity constraints are not expected with the build out of the site and a minimum number of left-turning vehicles is projected (a maximum of 26 vehicles), providing two-way stop control at the site entrances would be sufficient to accommodate the future traffic and DelDOT has agreed to permitting two-way stop control at the site entrances rather than requiring roundabouts.

Should New Castle County approve the proposed development, the following items should be incorporated into the site design and reflected on the record plan. All applicable agreements (i.e. letter agreements for off-site improvements and traffic signal agreements) should be executed prior to entrance plan approval for the proposed development.



1. The developer should reconstruct Old Porter Road, on both sides of the roadway along the entire length of the northerly frontage of the developer's property and to the west to a point just east of Grissom Drive, for a total of 3,350 feet. Old Porter Road is classified as a minor collector roadway which has a typical section of twelve-foot travel lanes and eight-foot shoulders. Due to drainage and other limitations along the roadway, the reconstruction should consist of two eleven-foot lanes with shoulders as follows:
  - a. On the north side of Old Porter Road, eight-foot shoulders should be provided from the point east of Grissom Drive to the easterly limits of the property frontage.
  - b. On the south side of Old Porter Road, eight-foot shoulders should be provided from the point east of Grissom Drive to the westerly limits of the approach to DelDOT's Bridge #1300383, further discussed in Items #2 and #3 below.

The developer should provide a bituminous concrete overlay to the existing travel lanes, at DelDOT's discretion. DelDOT should analyze the existing lane's pavement section and recommend an overlay thickness to the developer's engineer if necessary.

2. Within the limits of the reconstruction as mentioned in Item #1, a box culvert inventoried by DelDOT as Bridge #1300383 is functionally obsolete and will need to be replaced. DelDOT may replace the bridge as a State project, or may require the developer to replace the bridge at the expense of the State. Such expenses include design costs, necessary permitting, and right-of-way acquisition.
3. The developer will make such improvements to Old Porter Road east of the developer's northerly and southerly frontage on Old Porter Road to the point which is 200 feet west of the Old Porter Road/Delaware Route 71 intersection, at the developer's cost, so as to provide two eleven-foot lanes with five-foot shoulders for this portion of Old Porter Road. The timing for completion of the improvements defined herein will be phased consistent with the phasing of the development as set forth in the Record Plan to be approved by New Castle County, but, in any event, these improvements will not be required to be in place prior to the issuance of fifty percent (50%) of certificates of occupancy for both Sections 1 and 2 of the development.
4. To the extent necessary, developer shall be responsible for obtaining such interests in property as necessary to make the improvements to Old Porter Road as referenced in Item #3. In the event that, after good faith negotiations with the property owners, the developer is unable to obtain such interests in land required from those property owners who abut this



portion of Old Porter Road as are needed to make the identified road improvements, DelDOT agrees to use its authority pursuant to 2 Del. Admin. C. 2308 §3.5 to acquire such interests in land to accommodate the improvements to Old Porter Road and the developer shall be responsible for the cost of the interests in land to be acquired. In the event that DelDOT’s assistance is required, DelDOT agrees to work with the developer to acquire such interests in a timely fashion so that such interests can be acquired prior to the issuance of 50% of the building permits for Sections 1 and 2 of the development, and the improvements can be implemented as set forth in Item #3 above.

- The developer should construct a full movement access entrance on Old Porter Road (Site Access A), approximately 2,000 feet west of the Old Porter Road intersection with Delaware Route 71 and provide the lane configurations as shown in the table below:

<b>Approach</b>	<b>Current Configuration</b>	<b>Proposed Configuration</b>
Eastbound Old Porter Road	One through lane	One left turn lane, one through lane, and one right turn lane
Westbound Old Porter Road	One through lane	One left turn lane, one through lane, and one right turn lane
Northbound Site Access A	Approach does not exist	One shared left turn/through/right turn lane
Southbound Site Access A	Approach does not exist	One shared left turn/through/right turn lane

Based on DelDOT’s *Development Coordination Manual* and the updated Auxiliary and Bypass Lane Warrants from October 23, 2017, the recommended minimum storage lengths (excluding taper) of the separate left turn and right turn lanes along the Old Porter Road approaches to Site Access A are listed below. Although a left turn lane along westbound Old Porter Road is not warranted, it is recommended to be installed to be consistent with the eastbound Old Porter Road approach. The calculated queue lengths from the HCS analysis can be accommodated within the recommended storage lengths.

<b>Approach</b>	<b>Left Turn Lane</b>	<b>Right Turn Lane</b>
Eastbound Old Porter Road	95 feet	100 feet
Westbound Old Porter Road	95 feet	110 feet





6. The developer should construct a full movement access entrance on Old Porter Road (Site Access B), approximately 3,150 feet west of the Old Porter Road intersection with Delaware Route 71 and provide the lane configurations as shown in the table below:

Approach	Current Configuration	Proposed Configuration
Eastbound Old Porter Road	One through lane	One left turn lane, one through lane, and one right turn lane
Westbound Old Porter Road	One through	One left turn lane, one through lane, and one right turn lane
Northbound Site Access B	Approach does not exist	One shared left turn/through/right turn lane
Southbound Site Access B	Approach does not exist	One shared left turn/through/right turn lane

Based on DelDOT’s *Development Coordination Manual* and the updated Auxiliary and Bypass Lane Warrants from October 23, 2017, the recommended minimum storage lengths (excluding taper) of the separate left turn and right turn lanes along the Old Porter Road approaches to Site Access B are listed below. The calculated queue lengths from the HCS analysis can be accommodated within the recommended storage lengths.

Approach	Left Turn Lane	Right Turn Lane
Eastbound Old Porter Road	95 feet	145 feet
Westbound Old Porter Road	95 feet	145 feet

7. The developer should enter into a traffic signal agreement with DelDOT for the Porter Road/Old Porter Road intersection, where the developer will pay an equitable contribution towards the Traffic Signal Revolving Fund. Additional information regarding the signalization of the intersection can be found on page 16.
8. The following bicycle, pedestrian, and transit improvements should be included:
  - a. A minimum fifteen-foot wide permanent easement from the edge of the right-of-way should be dedicated to DelDOT along the site frontages on Old Porter Road. Within this easement, the developer should construct a ten-foot wide shared-use path along each side of Old Porter Road to the westerly limits of the approach to DelDOT’s Bridge #1300383 that meets current AASHTO and ADA standards. A minimum five-foot setback should be maintained from the edge of the pavement to the shared-use paths. If feasible, the shared-use paths should be placed behind utility poles. The developer





should coordinate with DeIDOT's Development Coordination section during the plan review process to identify the exact location of the shared-use paths.

- b. Sidewalks should be provided on both sides of all internal streets.
- c. ADA compliant curb ramps and a marked crosswalk should be provided along the Site Entrance approaches to Old Porter Road. The use of diagonal curb ramps is discouraged. DeIDOT and the developer will discuss during the Entrance Plan review process whether or not a marked crosswalk will be required for this development.
- d. Minimum five-foot wide bicycle lanes should be incorporated in the shoulder along both directions of Old Porter Road within the site frontage limits.
- e. Utility covers should be moved outside of any designated bicycle lanes and any proposed sidewalks/shared-use paths or should be flush with the pavement.

Please note that this review generally focuses on capacity and level of service issues; additional safety and operational issues will be further addressed through DeIDOT's Plan Review process.

Improvements in this TIS may be considered "significant" under DeIDOT's *Work Zone Safety and Mobility Procedures and Guidelines*. These guidelines are available on DeIDOT's website at [https://www.deldot.gov/Publications/manuals/de\\_mutcd/index.shtml](https://www.deldot.gov/Publications/manuals/de_mutcd/index.shtml). For any additional information regarding the work zone impact and mitigation procedures during construction please contact Mr. Don Weber, Assistant Director for Traffic Operations and Management. Mr. Weber can be reached at (302) 659-4651 or by email at [Don.Weber@delaware.gov](mailto:Don.Weber@delaware.gov).

Additional details on our review of the TIS are attached. Please contact me at (302) 266-9600 if you have any questions concerning this review.

Sincerely,  
Johnson, Mirmiran, and Thompson, Inc.

A handwritten signature in black ink, appearing to read 'Joanne M. Arellano', written in a cursive style.

Joanne Arellano, P.E., PTOE

cc: Mir Wahed, P.E., PTOE  
Enclosure

## **General Information**

**Report date:** December 2018

**Prepared by:** Karins and Associates

**Prepared for:** Red Lion HP LLC

**Tax Parcel:** 10-052.00-011, 10-052.00-018

**Generally consistent with DeDOT's *Development Coordination Manual*:** Yes.

## **Project Description and Background**

**Description:** The developer seeks to develop 244 townhouses and 283 age-restricted detached houses.

**Location:** The parcels are located along either side of Old Porter Road (New Castle Road 383). Townhouses are proposed for the land on the north side of Old Porter Road and age-restricted detached houses are proposed for the land on the south side of Old Porter Road.

**Amount of Land to be developed:** The assemblage of parcels is approximately 203.37 acres.

**Land Use approval(s) needed:** Entrance Plan approval.

**Proposed completion date:** 2024

**Proposed access locations:** Two full access points are proposed along each side of Old Porter Road, to form two new four-way intersections with Old Porter Road.

- 2018 Average Annual Daily Traffic on Old Porter Road: 3,092 vehicles per day.

## Site Map



\*Graphic is an approximation based on the Concept Plan prepared by Karins and Associates, dated May 30, 2017.

## Relevant and On-going Projects

DelDOT completed an improvement project within the study area: the *HSIP NCC SR 71, Old Porter Road to SR 7* (Contract #T201000701) project. The project was designed to improve safety and operations at the Delaware Route 71 intersections with Old Porter Road, Church Road, and Delaware Route 7.

As part of the DelDOT *HSIP NCC SR 71, Old Porter Road to SR 7* project, a traffic signal was installed at the Delaware Route 71 and Old Porter Road intersection. The northbound Delaware Route 71 approach to Old Porter Road was modified to provide one left turn lane and one through lane, the southbound Delaware Route 71 approach to Old Porter Road was modified to provide one through lane and one right turn lane, and the eastbound Old Porter Road approach was modified to provide one left turn lane and one channelized right turn lane. At the Delaware Route 71 intersection with Church Road, the northbound Delaware Route 71 approach was modified to provide one left turn lane, one through lane, and one right turn lane and the eastbound Church Road approach was modified to provide one shared left turn/through lane and one right turn lane. Access from northbound Delaware Route 7 to Church Road has been restricted. At the Delaware

Route 7 and Delaware Route 71 intersection, each approach was modified to provide one left turn lane, one through lane, and one right turn lane, with the exception of the northbound Delaware Route 71 approach which was modified to provide one left turn lane and one through lane. With the provision of separate left turn lanes along Delaware Route 7, the signal was modified to operate with protected and permissive left turn phasing along Delaware Route 7.

### **Livable Delaware**

*(Source: Delaware Strategies for State Policies and Spending, 2015)*

### **Location with respect to the Strategies for State Policies and Spending Map of Delaware:**

The proposed development is located within the Investment Level 2 and 3 areas.

### **Investment Level 2**

These areas can be composed of less developed areas within municipalities, rapidly growing areas in the counties that have or will have public water and wastewater services and utilities, areas that are generally adjacent to or near Investment Level 1 Areas, smaller towns and rural villages that should grow consistently with their historic character, and suburban areas with public water, wastewater, and utility services. They serve as transition areas between Level 1 and the state's more open, less populated areas. They generally contain a limited variety of housing types, predominantly detached single-family dwellings.

In Investment Level 2 Areas, like Investment Level 1 Areas, state investments and policies should support and encourage a wide range of uses and densities, promote other transportation options, foster efficient use of existing public and private investments, and enhance community identity and integrity. Investments should encourage departure from the typical single-family-dwelling developments and promote a broader mix of housing types and commercial sites encouraging compact, mixed-use development where applicable. Level 2 Areas share similar priorities as with the Level 1 Areas where the aim remains to: make context sensitive transportation system capacity enhancements, preserve existing facilities, make safety enhancements, make transportation system capacity improvements, create transit system enhancements, ensure ADA accessibility, and close gaps in the pedestrian system, including the Safe Routes to School projects. Other priorities for Level 2 Areas include: Corridor Capacity Preservation, off-alignment multi-use paths, interconnectivity of neighborhoods and public facilities, and signal-system enhancements.

### **Investment Level 3**

Investment Level 3 Areas generally fall into two categories. The first category covers lands that are in the long-term growth plans of counties or municipalities where development is not necessary to accommodate expected population growth during a five-year planning period (or longer). The second category includes lands that are adjacent to or intermingled with fast-growing areas within counties or municipalities that are otherwise categorized as Investment Levels 1 or 2. Investment Level 3 is further characterized by areas with new development separated from existing development by a substantial amount of vacant land that is not contiguous with existing infrastructure, areas that are experiencing some development pressure, areas with existing but disconnected development, and possible lack of adequate infrastructure.

The state will consider investing in infrastructure within Investment Level 3 Areas once the Investment Level 1 and 2 Areas are substantially built out, or when the infrastructure or facilities are logical extensions of existing systems and deemed appropriate to serve a particular area. The priorities in the Level 3 Areas are for DelDOT to focus on regional movements between towns and other population centers. Local roadway improvements will be made by developers and property owners as development occurs. Lower priority is given to transportation system–capacity improvements and transit-system enhancements.

### **Proposed Development’s Compatibility with Livable Delaware:**

The proposed development is located in the Investment Level 2 and 3 areas. According to Livable Delaware, Level 2 areas should promote a broader mix of housing types, such as single-family detached houses and townhouses. Level 3 areas may be desirable for a variety of housing types. Therefore, the proposed development is generally consistent with the 2015 update of the Livable Delaware “Strategies for State Policies and Spending.”

### **Comprehensive Plans**

*(Source: New Castle County 2012 Comprehensive Plan Update)*

#### **New Castle County Comprehensive Plan:**

The subject property is zoned as Suburban Transition. Rezoning is not necessary to permit the proposed land use.

#### **Proposed Development’s Compatibility with the New Castle County Comprehensive Plan:**

Per the *New Castle County Comprehensive Plan 2012 Future Land Use Map*, the area is designated for medium residential density. The proposed use appears to be generally compatible with the Future Land use designation.

Per the *New Castle County Unified Development Code*, Suburban Transition land use provides for high quality, moderately high-density development with a full range of residential uses and limited non-residential uses. The intensity accommodates a range of housing types from small single-family to multi-family. As such, the proposed use appears to be generally compatible with the New Castle County Comprehensive Plan.

### **Trip Generation**

The trip generation for the proposed development was determined by using the comparable land use and rates/equations contained in the *Trip Generation, 10<sup>th</sup> Edition: An ITE Informational Report*, published by the Institute of Transportation Engineers (ITE) for ITE Land Use Code 220 for Multifamily Housing (Low-Rise) and ITE Land Use Code 251 for Senior Adult Housing-Detached.

The proposed development would be comprised of 240 townhouses and 282 age-restricted detached houses; for the purposes of the TIS, 244 townhouses and 283 age-restricted detached houses were considered.

The peak period trip generation for the proposed development is included in Table 1.

**Table 1**  
Vista at Red Lion Section 1 and 2 Trip Generation

Land Use	ADT	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
244 Unit Multifamily Housing (Low Rise) (ITE Code 220)	1,804	25	86	111	82	49	131
283 Unit Senior Adult Housing - Detached (ITE Code 251)	1,405	30	60	90	66	42	108
<b>Net New Trips</b>		55	146	201	148	91	239

**Intersections examined:**

1. Site Access A/Old Porter Road (New Castle Road 383)
2. Site Access B/Old Porter Road (New Castle Road 383)
3. Porter Road (New Castle Road 48)/Old Porter Road (New Castle Road 383)
4. Delaware Route 71/Old Porter Road (New Castle Road 383)
5. Delaware Route 71/Church Road (New Castle Road 382)
6. Delaware Route 7/Delaware Route 71

**Conditions examined:**

1. Case 1 – 2018 Existing
2. Case 2 – 2024 without development
3. Case 3 – 2024 with development

**Peak hours evaluated:** Weekday morning and evening.

**Committed Developments considered:**

1. Meridian Crossing I
2. Meridian Crossing II
3. Rockwood, Section 1-A, Apartments
4. Rockwood, Section 1-B, Daycare (US 40 South side & Church Road East side)
5. Rockwood, Section 1-C, Apartments
6. Wellington Common retail Building
7. Elizabeth Plaza
8. St. Andrews Center
9. Salem Center, Parcel B (Glasgow Drive west side, north of US 40)
10. Peoples Industrial Park
11. 3601 Wrangle Hill Road – Wawa and Bank



12. St. Andrews Residential Addition
13. Porter Road Business Center
14. Woods at Mansion Farm
15. Colony at Summit Bridge East
16. Colony at Summit Bridge West
17. Caravel Farms

### **Intersection Descriptions**

*Note: The descriptions mentioned below incorporate the improvements constructed as part of HSIP NCC SR 71, Old Porter Road to SR 7 (Contract #T201000701) DelDOT Project. Based on field observations, these improvements have been installed.*

#### **1. Site Access A/Old Porter Road (New Castle Road 383)**

**Type of Control:** Proposed two-way stop-controlled intersection (four-leg intersection).

**Eastbound Approach:** (Old Porter Road) Proposed one left turn lane, one through lane, and one right turn lane.

**Westbound Approach:** (Old Porter Road) Proposed one left turn lane, one through lane and one right turn lane.

**Northbound Approach:** (Site Access A) Proposed shared left turn/through/right turn lane, stop controlled.

**Southbound Approach:** (Site Access A) Proposed shared left turn/through/right turn lane, stop controlled.

#### **2. Site Access B/Old Porter Road (New Castle Road 383)**

**Type of Control:** Proposed two-way stop-controlled intersection (four-leg intersection).

**Eastbound Approach:** (Old Porter Road) Proposed one left turn lane, one through lane, and one right turn lane.

**Westbound Approach:** (Old Porter Road) Proposed one left turn lane, one through lane, and one right turn lane.

**Northbound Approach:** (Site Access B) Proposed shared left turn/through/right turn lane, stop controlled.

**Southbound Approach:** (Site Access B) Proposed shared left turn/through/right turn lane, stop controlled.

#### **3. Porter Road (New Castle Road 48)/Old Porter Road (New Castle Road 383)**

**Type of Control:** Existing two-way stop-controlled intersection (four-leg intersection).

**Eastbound Approach:** (Reybold Station Driveway) Existing one shared left turn/through/right turn lane, stop controlled.

**Westbound Approach:** (Old Porter Road) Existing one shared left turn/through lane and one channelized right turn lane, stop controlled.



**Northbound Approach:** (Porter Road) Existing one left turn lane, one through lane, and one channelized right turn lane.

**Southbound Approach:** (Porter Road) Existing one left turn lane and one shared through/right turn lane.

4. **Delaware Route 71/Old Porter Road (New Castle Road 383)**

**Type of Control:** Existing signalized intersection (T- intersection)

**Eastbound Approach:** (Old Porter Road) Existing one left turn lane and one channelized right turn lane.

**Northbound Approach:** (Delaware Route 71) Existing one left turn lane and one through lane.

**Southbound Approach:** (Delaware Route 71) Existing one through lane and one right turn lane.

5. **Delaware Route 71/Church Road (New Castle Road 382)**

**Type of Control:** Existing two-way stop-controlled intersection (four-leg intersection).

**Eastbound Approach:** (Church Road) Existing one shared left turn/through lane and one right turn lane, stop controlled.

**Westbound Approach:** (Church Road) Existing one shared left turn/through/right turn lane, stop controlled.

**Northbound Approach:** (Delaware Route 71) Existing one left turn lane, one through lane, and one right turn lane.

**Southbound Approach:** (Delaware Route 71) Existing one shared left turn/through/right turn lane.

6. **Delaware Route 7/Delaware Route 71**

**Type of Control:** Existing signalized intersection (four-leg intersection).

**Eastbound Approach:** (Delaware Route 7) Existing one left turn lane, one through lane, and one right turn lane.

**Westbound Approach:** (Delaware Route 7) Existing one left turn lane, one through lane, and one right turn lane.

**Northbound Approach:** (Delaware Route 71) Existing one left turn lane and one through lane.

**Southbound Approach:** (Delaware Route 71) Existing one left turn lane, one through lane, and one channelized right turn lane.

*Note: Although Delaware Route 7 is designated a north/south roadway, for the purpose of this analysis Delaware Route 7 is designated as an east/west roadway.*

## **Transit, Pedestrian, and Bicycle Facilities**

**Existing transit service:** Delaware Transit Corporation (DTC) currently does not provide existing services via DART within the study area.

**Planned transit service:** Mr. Jared Kaufman, Planner at the DTC, was contacted. Per email correspondence on December 20, 2018 from Mr. Kaufman, there is no planned transit service within the study area.

**Existing bicycle and pedestrian facilities:** According to DelDOT's *New Castle County Bicycle Map*, the Statewide Bicycle Route (Bicycle Route 1) and Connector Bicycle routes exist within the study area. The Statewide Bicycle Route exists along Porter Road and traverses through one of the project's study intersections (the Porter Road intersection with Old Porter Road). The Connector Bicycle route exists along Delaware Route 71 and traverses through three of the project's study intersections (the Delaware Route 71 intersections with Delaware Route 7, Church Road, and Old Porter Road). There is an existing bike lane on eastbound Church Road which connects to the intersection with Delaware Route 71. There are no pedestrian facilities within the study area.

**Planned bicycle and pedestrian facilities:** Per email correspondence on January 18, 2019 from Mr. John Fiori, DelDOT's Bicycle Coordinator, the following improvements were recommended:

- A 10-foot wide shared-use path should be provided along each side of Old Porter Road.
- The site shall dedicate right-of-way per the roadway classification and establish a 15-foot wide permanent easement along the property frontage.
- All entrance, roadway and/or intersection improvements required shall incorporate bicycle and pedestrian facilities.

**Bicycle Level of Service and Bicycle Compatibility Index:** According to the League of Illinois Bicyclists (LIB), Bicycle Level of Service (BLOS) is an emerging national standard for quantifying the bike-friendliness of a roadway by measuring on-road bicyclist comfort levels for specific roadway geometries and traffic conditions. Utilizing the 10-year projected AADT along Old Porter Road site frontage with a 40 miles per hour speed limit and the provision of a five-foot bike lane, the BLOS with the build out construction of the proposed development is summarized below. The BLOS was determined utilizing the calculators published on the LIB website:

<http://rideillinois.org/blos/blosform.htm>

- Old Porter Road – BLOS: B (1.51-2.50)

## **Crash Review**

Per the three-year crash data included in the TIS, one fatal crash occurred in the study area at the intersection of Delaware Route 71 and Delaware Route 7. The fatal crash occurred on November 29, 2015 at 10:15 AM. At the time of the crash, it was daylight and surface conditions were wet. The crash was an angle crash caused by aggressive driving.

**Previous Comments**

The comments from the Preliminary TIS have been addressed in the TIS.

**Additional Notes**

For the signalization of the Porter Road/Old Porter Road intersection, the lane configurations should be maintained as shown in the table below:

<b>Approach</b>	<b>Current Configuration</b>	<b>Proposed Configuration</b>
Eastbound Driveway	One shared left turn/through/right turn lane	No Change
Westbound Old Porter Road	One shared left turn/through lane and one channelized right turn lane	No Change
Northbound Porter Road	One left turn lane, one through lane, and one channelized right turn lane	No Change
Southbound Porter Road	One left turn lane and one shared through/right turn lane	No Change

The recommended minimum storage lengths (excluding taper) of the separate left turn and right turn lanes along the Porter Road and Old Porter Road approaches are listed below. The left turn lane storage lengths are based on the HCS analysis results while the right turn lane storage lengths are based on the higher values between the HCS analysis results and DeIDOT's *Development Coordination Manual*.

<b>Approach</b>	<b>Left Turn Lane</b>	<b>Right Turn Lane</b>
Westbound Old Porter Road	N/A	40 feet
Northbound Porter Road	45 feet	65 feet
Southbound Porter Road	190 feet	N/A

The design should provide interconnection between the railroad and traffic signal equipment as well as provide preemption at the traffic signals for when trains are approaching.

## **General HCS Analysis Comments**

*(See table footnotes on the following pages for specific comments)*

1. For the intersection analyses, the TIS used HCS7 version 7.3 whereas JMT used HCS7 version 7.6.
2. The TIS incorporated grading information in the analysis, whereas JMT did not.
3. JMT utilized updated Cases 1, 2 and 3 volumes. The updated volumes were created to address some volume development inconsistencies identified in the TIS report.
4. Per DelDOT's *Development Coordination Manual*, JMT used a heavy vehicle percentage of 3% for each movement in the Cases 2 and 3 future scenario analyses, unless the existing heavy vehicle percentage was greater than 3% and there was no significant increase of vehicles along that movement, in which case the existing heavy vehicle percentage was used for analysis of future scenarios. The TIS utilized arbitrary heavy vehicle percentages.
5. Per DelDOT's *Development Coordination Manual*, JMT utilized the future PHF of 0.80 for roadways with less than 500 vph, 0.88 for roadways between 500 and 1,000 vph, and 0.92 for roadways with more than 1,000 vph or the existing PHF, whichever was higher whereas the TIS maintained the existing PHF.

Table 2  
Peak Hour Levels Of Service (LOS)  
Based on Traffic Impact Study for Vista at Red Lion Section 1 and 2  
Report Dated: December 2018  
Prepared by Karins and Associates

Unsignalized Intersection Two-Way Stop Control <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Site Access A/Old Porter Road (New Castle Road 383) <sup>2,3</sup>				
2024 With Development (Case 3)				
Eastbound Old Porter Road Left Turn	A (7.7)	A (8.1)	A (7.7)	A (8.1)
Westbound Old Porter Road Left Turn	A (7.6)	A (7.7)	A (9.4)	A (9.4)
Northbound Site Access A Approach	A (8.7)	A (9.9)	B (11.2)	B (12.0)
Southbound Site Access A Approach	A (8.6)	A (9.9)	B (10.2)	B (11.3)

Unsignalized Intersection Roundabout <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Site Access A/Old Porter Road (New Castle Road 383) <sup>4</sup>				
2024 With Development (Case 3)	-	-	A (4.2)	A (5.1)

<sup>1</sup> For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

<sup>2</sup> JMT configured the Old Porter Road eastbound approach as a left turn lane, a through lane, and a right turn lane whereas the TIS configured as a left turn lane and a shared through/right turn lane.

<sup>3</sup> JMT configured the Site Access A approaches as a shared left turn/through/right turn lane, whereas the TIS configured as a shared left turn/right turn lane.

<sup>4</sup> JMT completed roundabout analyses at Site Access A and B to address the December 21, 2018 correspondence from DelDOT Traffic. Single lane roundabouts were considered.

Table 3  
Peak Hour Levels Of Service (LOS)  
Based on Traffic Impact Study for Vista at Red Lion Section 1 and 2  
Report Dated: December 2018  
Prepared by Karins and Associates

Unsignalized Intersection Two-Way Stop Control <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Site Access B/Old Porter Road (New Castle Road 383) <sup>5</sup>				
2024 With Development (Case 3)				
Eastbound Old Porter Road Left Turn	A (7.7)	A (8.0)	A (7.7)	A (8.0)
Westbound Old Porter Road Left Turn	A (7.6)	A (7.7)	A (9.3)	A (9.6)
Northbound Site Access B Approach	A (8.6)	B (10.1)	B (11.5)	B (12.6)
Southbound Site Access B Approach	A (8.8)	B (10.3)	B (10.4)	B (11.6)

Unsignalized Intersection Roundabout <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
Site Access B/Old Porter Road (New Castle Road 383) <sup>4</sup>				
2024 With Development (Case 3)	-	-	A (4.2)	A (5.2)

<sup>5</sup> JMT configured Site Access B approaches as a shared left turn/through/right turn lane, whereas the TIS configured as a shared left turn/right turn lane.

Table 4  
Peak Hour Levels Of Service (LOS)  
Based on Traffic Impact Study for Vista at Red Lion Section 1 and 2  
Report Dated: December 2018  
Prepared by Karins and Associates

Unsignalized Intersection Two-Way Stop Control <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Porter Road (New Castle Road 48) /Old Porter Road (New Castle Road 383)<sup>6</sup></b>				
2018 Existing (Case 1) <sup>7</sup>				
Eastbound Old Porter Road Approach	D (27.3)	C (23.3)	D (29.1)	C (24.7)
Westbound Old Porter Road Left/Through	D (29.9)	F (55.8)	-	-
Westbound Old Porter Road Right	B (13.1)	B (10.5)	-	-
Westbound Old Porter Road Approach	C (21.1)	E (39.2)	D (33.8)	F (68.3)
Northbound Porter Road Left Turn	A (7.7)	A (8.1)	A (7.9)	A (8.1)
Southbound Porter Road Left Turn	A (9.0)	A (8.2)	A (8.9)	A (8.4)
2024 Without Development (Case 2)				
Eastbound Old Porter Road Approach	D (34.7)	D (28.8)	E (38.4)	D (30.8)
Westbound Old Porter Road Left/Through	F (51.5)	F (172.4)	-	-
Westbound Old Porter Road Right	B (14.2)	B (11.0)	-	-
Westbound Old Porter Road Approach	D (33.7)	F (121.1)	F (77.3)	F (232.5)
Northbound Porter Road Left Turn	A (7.8)	A (8.3)	A (8.0)	A (8.3)
Southbound Porter Road Left Turn	A (9.0)	A (8.4)	A (9.2)	A (8.6)

<sup>6</sup> JMT configured the westbound Old Porter Road approach as a shared left turn/through/right turn lane to account for the westbound through/left turn queue length extending and blocking the short right turn storage. The TIS configured this approach as a shared left turn/through lane and a channelized right turn lane.

<sup>7</sup> During the Case 1 AM peak hour, JMT configured the northbound Porter Road right turn lane as a channelized right turn lane consistent with existing conditions, whereas the TIS did not.



Table 4 (continued)  
Peak Hour Levels Of Service (LOS)  
Based on Traffic Impact Study for Vista at Red Lion Section 1 and 2  
Report Dated: December 2018  
Prepared by Karins and Associates

Unsignalized Intersection Two-Way Stop Control <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Porter Road (New Castle Road 48) /Old Porter Road (New Castle Road 383)<sup>6</sup></b>				
2024 With Development (Case 3)				
Eastbound Old Porter Road Approach	E (42.2)	D (34.8)	E (48.7)	E (38.1)
Westbound Old Porter Road Left/Through	F (84.6)	F (311.0)	-	-
Westbound Old Porter Road Right	C (15.3)	B (11.3)	-	-
Westbound Old Porter Road Approach	E (50.0)	F (205.5)	F (169.1)	F (399.3)
Northbound Porter Road Left Turn	A (7.8)	A (8.3)	A (8.0)	A (8.3)
Southbound Porter Road Left Turn	A (9.0)	A (8.5)	A (9.3)	A (8.8)

Unsignalized Intersection All-Way Stop Control <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Porter Road (New Castle Road 48) /Old Porter Road (New Castle Road 383)<sup>8,9</sup></b>				
2024 Without Development (Case 2)	-	-	D (33.0)	C (22.1)
2024 With Development (Case 3)	-	-	E (40.3)	C (24.8)

<sup>8</sup> JMT considered an all-way stop control at this location whereas the TIS did not.

<sup>9</sup> JMT configured the eastbound and westbound Old Porter Road approaches with a shared left turn/through/right turn lane. JMT configured the northbound Porter Road approach as a shared left turn/through lane and a channelized right turn lane and the southbound Porter Road approach as a left turn lane and a shared through/right turn lane.

Table 4 (continued)  
Peak Hour Levels Of Service (LOS)  
Based on Traffic Impact Study for Vista at Red Lion Section 1 and 2  
Report Dated: December 2018  
Prepared by Karins and Associates

Unsignalized Intersection Roundabout <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Porter Road (New Castle Road 48) /Old Porter Road (New Castle Road 383)</b> <sup>10</sup>				
2024 Without Development (Case 2)	-	-	A (9.1)	A (8.8)
2024 With Development (Case 3)	-	-	A (10.0)	A (9.8)

Signalized Intersection <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Porter Road (New Castle Road 48) /Old Porter Road (New Castle Road 383)</b> <sup>11</sup>				
2024 Without Development (Case 2)	-	-	C (32.6)	C (27.4)
2024 With Development (Case 3)	-	-	D (35.4)	C (29.5)

<sup>10</sup> JMT considered a single lane roundabout at this location whereas the TIS did not.

<sup>11</sup> JMT considered a signal at this location whereas the TIS did not, utilizing the lane configurations from Case 1 conditions.

Table 5  
Peak Hour Levels Of Service (LOS)  
Based on Traffic Impact Study for Vista at Red Lion Section 1 and 2  
Report Dated: December 2018  
Prepared by Karins and Associates

Unsignalized Intersection Two-Way Stop Control (T-Intersection) <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Delaware Route 71/Old Porter Road (New Castle Road 383)</b>				
2018 Existing (Case 1) <sup>12</sup>				
Eastbound Old Porter Road Approach	C (19.2)	C (19.7)	C (19.3)	C (19.7)
Northbound Delaware Route 71 Left Turn	A (8.3)	A (8.9)	A (9.1)	A (8.9)

Signalized Intersection <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Delaware Route 71/Old Porter Road (New Castle Road 383)</b>				
2018 Existing (Case 1) <i>with DelDOT Improvement Project</i> <sup>13, 14</sup>	-	-	B (15.8)	B (20.0)
2024 Without Development (Case 2) <i>with DelDOT Improvement Project</i> <sup>13, 14</sup>	-	-	B (17.2)	C (21.3)
2024 With Development (Case 3) <i>with DelDOT Improvement Project</i> <sup>14, 15, 16, 17</sup>	B (14.8)	B (16.8)	C (20.1)	C (22.4)

<sup>12</sup> During the AM peak hour, JMT utilized an existing heavy vehicle percentage of 50% for the northbound Delaware Route 71 left turn movement consistent with the existing traffic counts whereas the TIS utilized a heavy vehicle percentage of 5%.

<sup>13</sup> JMT modeled the Delaware Route 71/Old Porter Road intersection as a signalized intersection during Cases 1 and 2 consistent with existing conditions and the *HSIP, NCC SR 71, Old Porter Road to SR 7 DelDOT* project (Contract No. T201000701) whereas, the TIS modeled it as an unsignalized intersection.

<sup>14</sup> JMT modeled the signal with free operation utilizing a cycle length of 106 consistent with the DelDOT Signal Timing Plan.

<sup>15</sup> JMT modeled the eastbound Old Porter Road approach as a shared left and right turn lane consistent with the existing traffic operation whereas the TIS modeled as a left turn lane and a right turn lane.

<sup>16</sup> The TIS modeled the intersection as signalized with a 90 second cycle length.

<sup>17</sup> The TIS utilized a PHF of 0.89 whereas JMT utilized a PHF of 0.95 consistent with the existing traffic counts during the PM peak.

Table 6  
Peak Hour Levels Of Service (LOS)  
Based on Traffic Impact Study for Vista at Red Lion Section 1 and 2  
Report Dated: December 2018  
Prepared by Karins and Associates

Unsignalized Intersection <sup>1</sup> Two-Way Stop Control (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Delaware Route 71/Church Road (New Castle Road 382)</b>				
2018 Existing (Case 1)				
Eastbound Church Road Approach	C (21.4)	D (31.0)	C (21.3)	D (29.1)
Westbound Church Road Approach	D (28.0)	C (15.2)	D (31.1)	C (15.7)
Northbound Delaware Route 71 Left Turn	A (8.4)	A (9.2)	A (8.4)	A 9.3)
Southbound Delaware Route 71 Left Turn	A (8.3)	A (7.8)	A (8.6)	A (8.1)
2018 Existing (Case 1) with DelDOT Improvements <sup>18</sup>				
Eastbound Church Road Left/Through	-	-	D (26.5)	D (28.6)
Eastbound Church Road Right Turn	-	-	B (11.7)	B (13.9)
Eastbound Church Road Approach	-	-	C (19.3)	C (22.1)
Northbound Delaware Route 71 Left Turn	-	-	A (8.6)	A (9.3)
Southbound Delaware Route 71 Left Turn	-	-	A (8.6)	A (8.1)

<sup>18</sup> For Cases 1 and 2, JMT modeled the eastbound Church Road approach as one shared left turn/through lane and one right turn lane, and the northbound Delaware Route 71 approach as one left turn lane, one through lane, and one right turn lane. These lane configurations are consistent with the improvements as part of the *HSIP NCC SR 71, Old Porter Road to SR 7* DelDOT Project (Contract No. T201000701). Based on existing conditions, the improvements associated with the DelDOT Project have been installed. The TIS did not incorporate these improvements for Cases 1 and 2.

Table 6 (continued)  
Peak Hour Levels Of Service (LOS)  
Based on Traffic Impact Study for Vista at Red Lion Section 1 and 2  
Report Dated: December 2018  
Prepared by Karins and Associates

Unsignalized Intersection <sup>1</sup> Two-Way Stop Control (T-Intersection)	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Delaware Route 71/Church Road (New Castle Road 382)</b>				
2024 Without Development (Case 2) with DelDOT Improvements <sup>18</sup>				
Eastbound Church Road Left/Through	-	-	F (52.9)	F (62.3)
Eastbound Church Road Right Turn	-	-	B (12.3)	C (16.1)
Eastbound Church Road Approach	-	-	E (36.8)	E (42.6)
Northbound Delaware Route 71 Left Turn	-	-	A (8.9)	A (9.9)
Southbound Delaware Route 71 Left Turn	-	-	A (8.9)	A (8.2)
2024 With Development (Case 3) with DelDOT Improvements <sup>19</sup>				
Eastbound Church Road Left/Through	F (94.8)	F (118.8)	F (80.3)	F (93.7)
Eastbound Church Road Right Turn	B (13.1)	C (18.0)	B (13.0)	C (17.7)
Eastbound Church Road Approach	F (61.5)	F (73.6)	F (52.8)	F (59.6)
Northbound Delaware Route 71 Left Turn	A (9.2)	B (10.1)	A (9.1)	B (10.3)
Southbound Delaware Route 71 Left Turn	A (8.9)	A (8.1)	A (9.1)	A (8.3)

<sup>19</sup> The TIS and JMT both incorporated the improvements as part of the HSIP NCC SR 71, Old Porter Road to SR 7 DelDOT Project (Contract No. T201000701). Specifically, the eastbound Church Road approach was modeled as a shared left turn/through lane and a right turn lane, the westbound Church Road approach was modeled as a shared left turn/through/right turn lane, the northbound Delaware Route 71 approach was modeled as one left turn lane, one through lane, and one right turn lane, and the southbound Delaware Route 71 approach was modeled as a shared left turn/through/right turn lane.

Table 6 (continued)  
Peak Hour Levels Of Service (LOS)  
Based on Traffic Impact Study for Vista at Red Lion Section 1 and 2  
Report Dated: December 2018  
Prepared by Karins and Associates

Signalized Intersection <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Delaware Route 71/Church Road (New Castle Road 382<sup>20</sup>)</b>				
2024 Without Development (Case 2)	-	-	B (11.5)	B (16.6)
2024 With Development (Case 3)	-	-	B (11.8)	B (17.9)

<sup>20</sup> JMT considered a signal at this location whereas the TIS did not. JMT utilized a 90 second cycle length during the AM and PM peak periods. JMT used protected/permissive left turn phasing along the northbound Delaware Route 71 approach and split phasing along Church Road. The lane configurations are consistent with the lane configurations constructed as part of the *HSIP NCC SR 71, Old Porter Road to SR 7* DelDOT Project (Contract No. T201000701).

Table 6 (continued)  
Peak Hour Levels Of Service (LOS)  
Based on Traffic Impact Study for Vista at Red Lion Section 1 and 2  
Report Dated: December 2018  
Prepared by Karins and Associates

Unsignalized Intersection <sup>1</sup> Two-Way Stop Control (T-Intersection)	LOS per TIS		LOS per SimTraffic	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Delaware Route 71/Church Road (New Castle Road 382)<sup>21</sup></b>				
2024 Without Development (Case 2) <sup>18, 19</sup>				
Eastbound Church Road Left Turn	-	-	C (24.0)	E (38.5)
Eastbound Church Road Through	-	-	C (24.6)	F (53.5)
Eastbound Church Road Right Turn	-	-	A (5.3)	B (10.9)
Northbound Delaware Route 71 Left Turn	-	-	A (9.2)	B (12.3)
2024 With Development (Case 3) <sup>20</sup>				
Eastbound Church Road Left Turn	-	-	C (24.1)	F (58.0)
Eastbound Church Road Through	-	-	D (27.1)	F (59.6)
Eastbound Church Road Right Turn	-	-	A (10.0)	B (14.9)
Northbound Delaware Route 71 Left Turn	-	-	B (10.4)	C (18.9)

<sup>21</sup> JMT conducted a supplemental Synchro/SimTraffic analysis to evaluate delay at the Delaware Route 71/Church Road (New Castle Road 382) intersection considering the impacts of the adjacent signalized intersections. The delay results shown in the table are based on SimTraffic 10 methodology.



Table 7  
Peak Hour Levels Of Service (LOS)  
Based on Traffic Impact Study for Vista at Red Lion Section 1 and 2  
Report Dated: December 2018  
Prepared by Karins and Associates

Signalized Intersection <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Delaware Route 7/Delaware Route 71</b> <sup>22</sup>				
2018 Existing (Case 1) <sup>23</sup>	D (37.1)	D (40.5)	D (43.0)	E (77.9)
2018 Existing (Case 1) with DelDOT Improvement <sup>24, 25, 26, 27</sup>	-	-	E (61.8)	E (62.3)
2024 Without Development (Case 2) with DelDOT Improvement <sup>24, 25, 26, 27</sup>	-	-	E (72.4)	E (68.3)
2024 Without Development (Case 2) with Signal Optimization and DelDOT Improvement <sup>24, 25, 26, 27, 28</sup>	-	-	D (49.3)	D (48.8)
2024 With Development (Case 3) with DelDOT Improvement <sup>24, 25, 26, 27</sup>	C (30.2)	C (34.0)	F (86.7)	E (70.7)

<sup>22</sup> Although Delaware Route 7 is designated as a north/south roadway for the purpose of this analysis JMT considered Delaware Route 7 as an east/west roadway.

<sup>23</sup> JMT modeled the signal with free operation and a cycle length of 109 seconds, consistent with the DelDOT Signal Timing Plan whereas the TIS did not.

<sup>24</sup> JMT modeled the signal with free operation and a cycle length of 161 seconds, consistent with the DelDOT Signal Timing Plan whereas the TIS did not.

<sup>25</sup> JMT configured the eastbound and westbound Delaware Route 7 approaches as a left turn lane, a through lane and right turn lane, the northbound Delaware Route 71 approach as a left turn lane and a through lane, and the southbound Delaware Route 71 approach as a left turn lane, a through lane, and a channelized right turn lane consistent with existing conditions and the *HSIP, NCC SR 71, Old Porter Road to SR 7* DelDOT Improvement Project (Contract No. T20100070). Based on existing conditions, the improvements associated with the DelDOT project have been installed. As such, JMT incorporated these improvements for Cases 1 and 2 whereas the TIS did not. Both the TIS and JMT incorporated these improvements for Case 3.

<sup>26</sup> JMT modeled the eastbound and westbound Delaware Route 7 approaches with concurrent phasing and left turns as a protected-permissive phase consistent with existing conditions whereas the TIS modeled the eastbound and westbound Delaware Route 7 approaches as split phase. JMT modeled the northbound and southbound Delaware Route 71 approaches as split phase consistent with existing conditions whereas the TIS modeled northbound and southbound Delaware Route 71 with concurrent phasing and left turns as a protected-permissive phase.

<sup>27</sup> JMT omitted the Delaware Route 71 northbound right turns consistent with existing conditions and the DelDOT Improvement Project (Contract No. T20100070) whereas the TIS did not.

<sup>28</sup> Signal Optimization scenario includes optimizing signal split and cycle lengths.

Table 7 (continued)  
Peak Hour Levels Of Service (LOS)  
Based on Traffic Impact Study for Vista at Red Lion Section 1 and 2  
Report Dated: December 2018  
Prepared by Karins and Associates

Signalized Intersection <sup>1</sup>	LOS per TIS		LOS per JMT	
	Weekday AM	Weekday PM	Weekday AM	Weekday PM
<b>Delaware Route 7/Delaware Route 71</b> <sup>23</sup>				
2024 With Development (Case 3) with <i>Signal Optimization</i> and with <i>DelDOT Improvement</i> <sup>24, 25, 26, 27, 28</sup>	-	-	D (52.2)	D (51.1)